

The relation between the Environment and Pandemics

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Abstract—In late 2019, one of the biggest pandemics of our time, with the power to completely shut down cities, was revealed. This is Sars-cov-2, which spreads very quickly and is transmitted through the air. The Coronavirus is nothing new to the world and warnings about the risk of pandemics have existed for many years, such as that of the 2013 epidemic, made by the WHO (World Health Organization) at a time when there was already alarm about the potential of this virus to cause outbreaks. Pandemics are nothing new to humanity. They were present at different times in history, and this paper aims to present the link between pandemics and disturbances of the natural environment, with emphasis on zoonoses. Some pandemics and their consequences will be briefly exposed, pointing out parallels between them. The study was carried out through the analysis of scientific articles within the specified topic in journals with a high level of reliability, seeking to understand this phenomenon and how to face them. This paper was written while the world was going through the Sars-cov-19 pandemic and was evolving together with the discoveries made day by day by the scientific world. Goals were defined for this paper, such as studying zoonoses and their forms of transmission, analyzing the human factor and how it impacts the environment, and pointing out solutions to solve these problems. This literature review concludes that when humans invade the natural environment and destroy existing relationships in this place, diseases transmitted from animals or from the environment itself can arise, which may or may not cause new pandemics through zoonoses.

I. INTRODUCTION

Emerging infectious diseases have socioeconomic, environmental, and ecological factors as a tripod, in addition to the risk of starting in countries in the south of the globe, in tropical areas, where studies and prevention resources are very low, and warnings are usually ignored. Several of them that now plague humanity began with

deforestation, such as the Black Death, Chagas Disease, Toxoplasmosis, Leprosy, Rabies, AIDS, Malaria, Ebola, among many others that have not even been named or studied (Souza, 2020).

In the 1980s there was a large spread of the HIV virus, an example of zoonoses that pass from animals to humans.

It should be noted that about 70% of infectious diseases came from wild animals (JONES et al, 2008).

Everything has become very accessible and continuous, causing the virus to spread very fast across the planet. Cheng et al (2007) warned of the great risk of the coronavirus, which has come to become today's major health problem. According to Ma (2020), the first Case of SARS-CoV-2 occurred on November 17, 2019. Prior to that, China's health authorities pointed to December 8. The author also reports on the possibility of there being cases prior to this date, not knowing exactly who patient 0 (zero) was. For the approach of this paper, we used the bibliometric methodology that, according to Treinta et al (2014), aims to gather the knowledge produced by the scientific community on this subject and thus seek solutions to point out ways to avoid greater damage as a result of new pandemics.

Therefore, the search for answers to this question becomes essential for the establishment of prudence mechanisms. In this sense, by carrying out this study, we sought to point out the ways in which future pandemics can be prevented through knowledge about their origins.

II. ENVIRONMENT

Initially, the environment is commonly linked to natural environments such as forests and what's inside them; but Primavesi (1997) also refers to buildings, cars, cities, and everything else. The author emphasizes that the environment is not just the space in which we live, but the space of which we are all part.

For Meyer-Abich (1993), the thought of the isolated human being does not match reality, it also belongs to a series of interconnections with the environment. In other words, a species is dependent on a certain number of elements from nature and relationships are indispensable for life to exist. Morin (1988) contributes to this thought by showing that nature is not an inert shell, but a complex network of multiple dependencies of which man is a part.

Primavesi (1997) comments on the human view of nature, how it is often seen only as a resource; this view places the blameless human being for destroying various connections and extinguishing species of fauna and flora.

Nowadays, with the current circumstances in which we find ourselves, it is increasingly imperative to acquire knowledge about the natural environment (Keys, 2021) because, according to Freitas (2003), environmental problems are also health problems.

Porto (1998) states that one of the main points of the environmental issue lies in the attempt to understand, through interdisciplinary and transdisciplinary approaches,

the environmental problems and their possible consequences.

In this sense, Jacobi (2003) reports that the knowledge produced should aim to appreciate all the relationships between the natural and the social environment, including analyzing this phenomenon in order to have sustainable development as an alternative, respecting each node of this complex tangled web that defines the environment.

Pandemics

The issues of pandemics are always associated with a disturbance in the ecosystem caused by the arrival of a species that is not part of that environment, or the destruction of natural environments, initially for the settlement of human societies, and, later in history, the destruction of resources for the development of society (Aufderheide et al, 1998).

Aufderheide et al. (1998) continues the reasoning by describing a trip to the past, speaking of the Plague of the Philistines in 1320 B.C. which, in some ways, somewhat resembles the bubonic plague. Little (2007), on the other hand, discusses the similarity between diseases such as smallpox, typhoid, and measles that could inflate the total number of deaths in the Middle Ages.

Most of the named pandemics in history happen due to a zoonosis that, in turn, occurs through an environmental disturbance, such as the Justinian plague that originated due to the total lack of hygiene in the largest city in the world at the time, the city of Constantinople (WADE, 2010). The bubonic plague, as described by O'Neill (1993), spread through infected rats that arrived in Europe via ships and carriages transporting food, weapons, and clothing.

About the Spanish flu of 1918, there are several speculations about its origin, but the most likely would be the hospital camp in the UK. Honigsbaum (2018) reports that 100,000 soldiers from that camp passed through the hospital every day seeking treatment due to chemical attacks and injuries; in this way, they could have spread the flu throughout the UK. The site was also a pigsty to which nearby villages brought birds for supplies. Shanks (2016) points out that there is evidence that the virus was already circulating in the European army months before and probably, years before 1918.

According to Mandell (2010), acquired immunodeficiency syndrome (AIDS) was first discovered in clinical form in 1981 in the United States. The first cases were drug users and homosexuals, who were already suffering from low immunity, and there is no clear reason. According to Gottlieb (2006), the patients had pneumonia caused by the *Pneumocystis carinii* fungus, which was an opportunistic infection. Hymes (1981) reports that in the year 1981, many homosexuals developed a rare skin cancer

called Kaposi's Sarcoma, and when the Centers for Disease Control and Prevention (CDC) was contacted, the cases had already spread to many places. Initially, the CDC did not yet have a name for this disease, but only referred to it by way of clinical conditions in which patients had, for example, lymphadenopathy. Barré-Sinoussi (1983) named the disease "persistent generalized lymphadenopathy." Other names widely used early on were "Kaposi's Sarcoma" and "opportunistic infections."

According to Sharp (2011), HIV-1 and HIV-2 originate in West African primates, a Transmission took place at the beginning of the 20th century. Thus, Gao (1999) discusses HIV-1 coming from southern Cameroon and would be a virus that evolved from SIV, Simian Immunodeficiency Virus, which infects wild chimpanzees. As for HIV-2, for Reeves (2002), the virus would have its origin in southern Senegal and would still have as its closest relative the "Cercopithecoidea" virus, which is from a race of primates known as Old World monkeys, which are resistant to HIV-1. Sharp (2001) explains that, probably, the virus has mutated at least on 3 occasions, giving rise to groups (M, N, and O). Acquired immunodeficiency syndrome, better known by the acronym AIDS, is a disease of the human immune system caused by the human immunodeficiency virus, HIV (Weiss, 2002).

Recently, due to a major historical moment being experienced in 2019-2020, Sars-Cov-2 has been the subject of several conspiracy theories that permeate to the date of editing this dissertation. Theories that this virus was a Chinese weapon for global domination have been spread by heads of states and internet groups (Morel, 2021).

Describing the recent history concerning Covid-19, Li (2020) reports that in December 2019, cases of pneumonia began to appear that were related, epidemiologically, to probable exposure to the live, free-range animal market in Wuhan. Chinese health authorities issued an alert about this problem to the World Health Organization. Later, according to the WHO (2020), it was revealed that cases of pneumonia were caused by a type of coronavirus. Gorbalenya (2020) and Wu (2020) named this new variant of coronavirus as Sars-Cov-2.

According to Khalil & Khalil (2020), coronaviruses belong to the family Coronaviridae, which comprises 2 subfamilies, 5 genera, 26 subgenera, and 46 virus species. SARS-CoV-2 belongs to the genus. Beta coronavirus, subgenus Sarbecovirus, species severe acute respiratory syndrome-related coronavirus, and is related to the acute respiratory syndrome. Its classification was performed by the International Committee on Taxonomy of Viruses (ICTV), taking into consideration mainly its molecular and phylogenetic characteristics, and not the disease it causes.

The WHO (2020) points out that the subgenus Sarbecovirus caused an outbreak between 2002 and 2003, an epidemic that reached a few 8,000 infected people. In early March 2020, the WHO declares the coronavirus to be a pandemic.

In further studies, a similarity of approximately 96% was found with the coronavirus of a bat species *Rhinolophus sinicus* (horseshoe bat) and it was possible to state that the origin would have been from such an animal. Furthermore, a competing theory to this, pointed out by Lan (2020), Xiao (2020), and Liu (2020), would be that of pangolins, an intermediate species to transmission to humans.

Unlike other viruses that have struck humanity in recent decades, coronavirus is highly recombinogenic, as Forni (2017) points out.

This thought is widely accepted in the scientific community, as Maciej et al (2020) state in their study, which sought the origin of the virus in question. The study points out that this may have several possible sources of origin. For their research, the team used 3 different bioinformatics approaches in order to model and remove the parts that recombine in the Sars-Cov-2 genome. The researchers' next step was to reconstruct the phylogenetic history by comparing the mismatched regions and showing which viruses were already involved in past events.

Even with the ease of access to information due to social media, Sars-Cov-2 had and still has a great enemy called "denialism." The denialists, at first, led several people not to believe in the disease; in the second moment, they delegated remedies that had no proven efficacy (Morel, 2021).

Due to the coronavirus, the modeling system for an immunizer has changed and many countries have come together to create an effective remedy against this virus. The first tested and approved vaccines date only 10 months after the causative agent became public. Thus, according to Cognys (2021), the pharmaceutical company Pfizer has developed an immunizer called BNT1262, made of messenger RNA that simulates the genetic material of the virus and creates antibodies for the disease in question. This immunizer reached 95% efficacy in its test phase.

Even with the immunizer already produced, in many countries' vaccination is slow or almost non-existent. Riou (2020) states that each infected person can transmit to 4 more people, leading to a lack of control of the virus, which can cause mutations, to which immunizers lose, in part, their effectiveness.

Yamamoto et al (2020) report that although covid-19 is a respiratory disease, it also affects the brain and other

organs, such as the heart, livers, and kidneys. The author also discusses neuropsychiatric manifestations that are common in viral pandemics and do not usually receive recommended attention. Also, new evidence shows how the virus causes hemorrhagic and immune responses that affect every organ in the human body.

Finally, Yamamoto et al (2020) point out how SARS-CoV-2 affects the mental health of patients, families, and society in general.

The world is in a state of crisis in relation to nature. Entire ecosystems are being destroyed in order to increase the financial power of countries that already have high capital.

Even with the warning of scientists, in several articles, this has had no effect. For Ripple et al (2019), scientists have a moral obligation to warn humanity about any catastrophic threat. Furthermore, according to Ripple et al (2019), with the support of more than 11,000 scientists around the world, all of them claim that the planet is experiencing a climate emergency.

In 1979, the First World Climate Conference took place in Geneva, at which an agreement was reached that climate change should have urgent action. After that, at the Rio Summit in 1992, the Kyoto Protocol in 1997, and the Paris Agreement in 2015, scientists warned of the same directions the world was taking. However, as of the publication date of Ripple et al (2019), all the data indicated that greenhouse gas emissions were still increasing in an uncontrolled manner.

Briggs et al (2015) argue that just using global surface temperature indicators is ineffective, and it is necessary to look at human activities that cause global warming. The researcher and his team warn about the need for governments and society to have access to various indicators of activities that have an impact on greenhouse gas emissions and their consequences on the climate and environment.

According to Ripple et al (2019), the climate crisis is totally linked to the rampant lifestyle consumption of the planet's affluent population. The countries that have the largest gross domestic products (GDP) in the world are also the ones that emit the most greenhouse gases.

In Brazil, public policies around the government have run contrary to the warnings of the scientific community following the 2018 election.

Thus, with the current situation of the Amazon being exploited and destroyed, the point of connection between the disturbance of the natural world and most of the pandemics present in human history is reached. Therefore, zoonoses, which are diseases transmitted from animals to

humans, usually manifest themselves exactly at this time of disturbance between the environment and humans. Johnson et al (2015) state that most human infectious diseases, especially recent emerging pathogens, originate from diseases in wild or domestic animals. A risk to global health. Considering the above, in 2015, the author predicted an emerging risk in a possible zoonosis.

Johnson et al (2015) declare that the world is dominated by viruses and bacteria, most of which do not cause any harm to human beings; however, some can be very dangerous. In the last 80 years, 60% of the diseases that have ravaged humans have originated from animals, of which 70% came from wild animals and the other 60% from domestic animals. When these diseases cross the animal barriers and pass on to humans, physical contact with other beings facilitates the transmission of this disease. Considering the number of people clustered in a city and their displacement globally, the virus receives all the necessary conditions to cause a pandemic.

During the Covid-19 pandemic, scientists needed to produce articles disproving theories that Covid-19 was produced in a laboratory. Andersen (p. 452, 2020), in his work, states that "Our analyses clearly show that SARS-CoV-2 is not a laboratory construct or a purposefully manipulated virus."

Although the ingestion of exotic animals is very common in Chinese culture, what is most considered for more production of these foods is, as Li (2020) cites, the so-called neophiliac gastronomic tourism, where the population of rich countries, people with high purchasing power, go to countries like China to consume these types of animals. This peculiar culture, combined with the way we treat the planet, leads to the disturbance of the environment and, in turn, causes wild animals to frequent the same place as humans, and such a cycle leads to new mutations.

Khalil (2016) points out that in an environment with high biodiversity, the few animals that carry a lot of diseases get diluted with animals that convey no danger to humans and the name of this event is "dilution effect." By destroying the fauna, the first animals that disappear are the ones that do not transmit risks, because, in a way, they are more fragile and dependent on the place where they live; and those that carry more parasites, multiply and become more present throughout the territory.

Also, according to Khalil (2016), with a larger population of animals having more parasites, there is a greater exchange of viruses between them, and they recombine until they can transmit to humans. Thus, the human way of life, especially in rich countries, is leading to the emergence of new diseases at an ever-increasing rate.

Meanwhile, the Brazilian Society of Tropical Medicine (2020) reports that scientists have been warning about zoonotic pandemics for decades, without getting answers from governments. Some of these infections could become catastrophic events even more intense than Covid-19, as more and more forest greenery is lost and biodiversity decreases, making pandemics far more common for the world.

III. METHODS

The present study has as its objective the knowledge about the health disaster situation brought about by a virus that "stopped the world," leading it to adapt to a new reality.

In order to achieve the purposes of this paper, the main published researches on the topic of pandemics and the environment were searched in the literature (in the world-renowned main scientific journals). The main pandemics prior to Sars-Cov-2 were also taken into consideration in order to equate and identify their origins.

To this end, we used literature review literature research defined by Gil (2010) as a type of research that includes printed and digital scientific materials such as books, journals, and periodicals, to respect all safety procedures due to the pandemic.

The data contained in this paper were taken from scientific research published in articles and books that address the topics contained and agglutinated so that we could find measures to combat and prevent the prospect of new pandemics.

Taken into account in this composition were the hypotheses of how pandemics occur: "Would it be due to a disturbance in the environment, because of unaware exploitation and destruction of natural means, or a naturally occurring one?"

Such questions were put on the agenda as well as grounded in science, and indicators were sought for the analysis of such answers.

Materials

The research was carried out in the databases of PubMed, Scopus, Google Scholar, Nature, Science, The Lancet, and Scielo databases, the Journal of the American Medical Association, Center For Disease Control, Cambridge University Press; The New England Journal of Medicine; World Health Organization, and New York: Oxford University Press, with a focus on obtaining and analyzing published journals.

Methods

This is an exploratory and narrative study on the relationship between the environment and pandemics, as a

literature review. The method of consulting scientific articles on the subject had 3 main points:

- The first refers to articles considered historical, where they pointed out the pandemics in their beginning. As an example, we have articles related to the attempt to understand AIDS and how it would have become a pandemic. These articles, then, refer to the dates on which each case or subsequent studies were investigated, which pointed to the causes and consequences of each disease;
- The second refers to data that show the human impacts on nature that, in this way, culminated in pandemics. Such articles alone need to have their dates of study taken into consideration, since nature is increasingly attacked and, because of this, as Steffen et al (2011) argue, we live in a new phase of the earth called the Anthropocene, where all modifications made by man in nature result in irreversible consequences. Also taken into account in this follow-up were articles from electronic scientific journals with credibility on an academic level and after research, looking for the data that prove what is being said in such media.
- The third group of articles researched is related to Sars-Cov-2 and is divided into two subclasses. Those launched at the beginning of the pandemic, which aimed to find out what this new disease was all about. The second subclass is dated from the last 8 months and focuses on pointing out where the virus comes from, how it spreads, and possible vaccines. Materials were obtained between January 6 and May 28, 2021. Original and review studies were obtained and analyzed, in which their titles, abstracts, and topics were aligned with the terms of interest of the referred proposal. The contents of interest were described according to their relevance in contributing to the objective of this paper.

Data Collection

The data obtained in the present work are from articles that describe pandemics, published in scientific journals. Such scientific journals were accessed through portals such as Scielo and Google Scholar, and their sources were verified, taking care to collect the information from the original articles.

Therefore, the search bases for these data were PubMed, Scopus, Nature, Science. In terms of information, The

Lancet, Journal of the American Medical Association, Center for Disease Control, Cambridge University Press; The New England Journal of Medicine; World Health Organization and New York: Oxford University.

Data Analysis

The analysis of the various articles that make up the present paper has as key points the data of the articles that describe a disease or the projects published in the period in which the most recent pandemics were discovered. In the case of the most remote diseases, such as the Plague of Justinian and other pandemics, articles were also searched that dealt with them in a historical way.

Once each of the pandemics was described, journals were searched for detailing the disease and its causes. In some cases materials were obtained to describe how it was fought, making a parallel described in greater detail in the conclusion.

Therefore, the date of each article responds to a part of the investigation, for example: when we mention AIDS, we went through articles published in the period when the disease appeared in the United States and, after that, it became the pandemic that until today it makes victims, with updates until reaching the name we know today as Acquired Immunodeficiency Syndrome.

In the case of the description of the environment, we sought to understand how this term is understood and what exactly this means is. Consequently, old records of researchers were investigated with a clear definition of the term. Then there was an understanding of what an aggression to the environment that humans are part of is, and what the human influence is on pandemics and zoonoses.

When it comes to the reason for this paper, SARS-CoV-2, one should keep in mind the speed with which new articles have been obtained and new evidence of the disease. Papers generated in the very early 2020s, therefore, have the informational weight of how the virus came to be transmissible to humans and where it might have started. Throughout the year 2020 and into the first quarter of 2021, clarification was obtained about the disease (clinical picture and correlated mechanisms) and how to deal with the pandemic that is currently ravaging us.

IV. RESULTS

It can be defined as a sum of the articles presented that the disturbance in the natural environment and the coexistence with wild animals, as Capra (1996) argues, treats nature as an interconnected web of relationships, so that when one end of this web is broken, these relationships collapse.

Porto (1998) states that, with the destruction of the natural environment of one animal or several, the global ecological risks increase, especially in urban-industrial environments that have as one of their characteristics the great concentration of pollution. In this sense, there would be a stampede of animals considered more fragile, leaving only those animals that have a greater risk of transmitting zoonoses to humans—because they are more resistant since they have adapted—who start living with humans or being hunted by them. Meanwhile, the virus contained in them undergoes mutations and, consequently, by these means, ends up reaching humans.

Freitas (2003) contributes to this theme by establishing the correlation that environmental problems are also health problems, arguing that human society is in fact affected in several segments when a disturbance occurs in the natural environment.

The way to fight or, in cases like the present one, to contain a zoonosis is only with the respectful work between man and the natural environment. According to Keyes (2021), it is increasingly imperative to acquire knowledge about the natural environment, and Barreto (1998) completes talking about how we can bring man closer to nature and, in doing so, we will know all the benefits and risks that we find in the environment. through a biological view of the phenomenon between environment and disease.

This way of looking at the environment, in itself, already leads us to the duty and the right to preserve it, since we depend on it and every species, independent of the human race, also needs its natural environment and its confections.

Still, on this topic, we cannot fall into anthropocentrism in its classical sense, which has its construction within Greek philosophy, in which man and nature were completely separated, but which prevails in most of today's environmental policies. There is a concern with the elements that only guarantee the survival of the human species, as if the whole world were just their means of extracting everything for their own benefit, forgetting all the other interconnections that the environment produces.

Unfortunately, for many, there is still the differentiation of human beings and all the rest of biodiversity and natural environments, with a view of superiority and that all the environment and animals are here for man's delight and enjoyment. When in fact, human beings are part of this environment and are not more important than the rest. The human being alone has an intellect developed enough to dominate and modify the environment (PRIMAVESI, 1997). The author also talks about the only way out, which would be science and environmental studies in an appropriate way.

When we look at past pandemics, as Wade (2010) talks about Justinian's Plague, and O'Neill (1993), the Black Death, we have cities with many people without basic hygiene and the destruction of natural means to shelter that population, which later brought disease and death. Years later, Kolata (1999) talks about the Spanish Flu, in which one of its possible causes would be a hospital whose place served as a pigsty, in which the daily coexistence of animals, wounded and dead soldiers may have facilitated the mutation of the virus, thus bringing a large contingent of deaths.

It is also known that the AIDS virus was spread in the human population from living with monkeys.

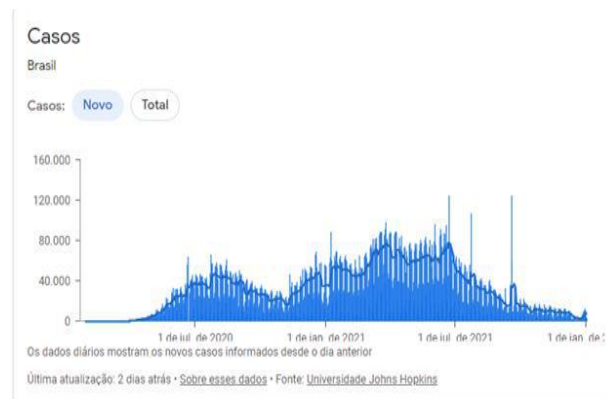
One of the possible origins of the Sars-Cov-2 virus would be bats, which in turn had a secondary host, pangolins. Soon, in recent history dating back to Covid-19, according to Li (2020), in December 2019, cases of pneumonia began to appear, the connection of which was the passage of these patients through the live animal market kept outdoors in Wuhan.

With all these data gathered, the result is the lack of control of the natural environment, which is modified by man, as the main source of zoonotic pandemics and that the solution may be in the place itself (where today is deforested and destroyed), through research and conservation measures. Today, there are several forms of sustainable management that do not harm nature to the point of great disturbance. Zoonoses are diseases transmitted from animals to humans, as discussed in the present study, as well as in the case of Sars-Cov-2. The most accepted hypothesis is that it originated in the animal market in Wuhan, due to the inadequate habits of keeping them in these places.

Brazil is being severely punished by Covid-19. According to reports by Castro (2019), Brazil is the only country with a population of over 100 million that has a free and comprehensive healthcare system throughout its territory. However, it is a victim of misinformation due to the neglect of scientific warnings.

Looking at chart 1 of Covid-19, in the first days of 2022 we can see the difference in cases that occurred after the vaccines started, where there were peaks on March 25 with 98,261 new cases, and on June 22 we got 124,248 new cases of SARS-CoV-2.

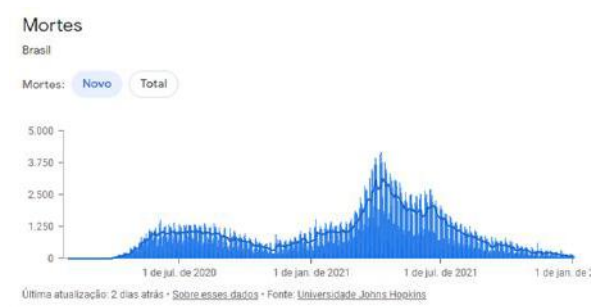
Chart 1 - Cases of SARS-CoV-2 in Brazil.



**Source::Covid map, Jan 3rd, 2022,
available at: <https://news.google.com/covid19/map?hl=pt-BR&gl=BR&ceid=BR%3Apt-419&state=1&mid=%2Fm%2F015fr>**

We can also look at the deaths occurring in the years 2020 and 2021, pointed out by chart 2, where we had the peak of deaths above 1000 reached in May 2020 until the end of August, subsequently with a second wave of deaths above 1000 people, starting in December and going until July 2021, with a major peak of 4,000 deaths in the month of April.

Chart 2– Graph of Deaths by Sars-CoV-2.



**Source: Covid map, Jan 3rd, 2022, available
at: <https://news.google.com/covid19/map?hl=pt-BR&gl=BR&ceid=BR%3Apt-419&state=1&mid=%2Fm%2F015fr>**

Chart 3- Vaccines administrated in Brazil.



Source: Covid map, Jan 3rd, 2022, available at: <https://news.google.com/covid19/map?hl=pt-BR&gl=BR&ceid=BR%3Apt-419&state=5&mid=%2Fm%2F015fr>

When looking at chart 3, which refers to the number of vaccines taken and comparing it with the number of deaths from Covid-19, we can see the impact that the vaccine has had on the decrease in the total number of deaths in Brazil. Which is pertinent, since there has been much controversy in this regard, both in the country and around the world, concerning the efficiency of the vaccine and even the use of drugs unproven by the scientific world, which led to the creation of a Parliamentary Inquiry Commission (CPI) for the Pandemic.

The CPI, which sought to understand the role of Brazilian rulers in seeking the treatment of Brazilians, concluded with a report, according to Siqueira (2021), of a total of 1179 pages. The document, which was divided into 16 chapters, includes investigated and evidences, and indicts 66 people and two companies related to some crime.

The discussion is about the disorders that can be generated due to an environmental disturbance. The disregard for science and the fabrication of fragile news and studies, identified as science, which can result in an exacerbated number of deaths. Even though we have one of the best tools in the world, which is the Unified Health System (SUS), we cannot use them properly, as the presence of conspiracy theories gets in the way.

Furthermore, Berkman et al (2005) point out how all emergencies were developed during the HIV/AIDS pandemic and how the SUS dealt with it, in addition to mitigating the crisis. Being a program widely known in the world, the program to combat HIV/AIDS was a reference worldwide, in the way the pandemic was treated in Brazil.

Berkman et al (2005) say that in 1990 the World Bank predicted that in 10 years the Brazilian population with HIV would be 1.2 million people. However, 14 years later, according to the author, these data were still not materialized and, contrary to what was pointed out, it is estimated that 600,000 people in Brazil have contracted

HIV, in addition to 362,364 who have developed AIDS. Thus, the incidence of HIV is much lower than projected by the institution of the World Bank.

What led Brazil to contain the advance of this pandemic was “citizenship” and “solidarity.” The Brazilian people and the State, through democratic institutions, gave citizenship to the infected, and solidarity was shown through respect for human rights. Several advertisements and lectures on the disease were linked to the entire population, even the neediest, making Brazil successful and keeping the pandemic under control (BERKMAN et al 2005).

As Massuda et al (2018) point out, the system had a very significant budget cut, but it was still expected that the Unified Health System would leave Brazil in a comfortable position in relation to this crisis experienced in the pandemic. However, what was seen was the country being for a long time the second in numbers of cases and deaths, coming to lead the list, in this regard, between March and July 2021 (FIOCRUZ, 2021).

Barberia and Gómez (2020) point to a combination of inaction and irregularities, such as the promotion of chloroquine, among other treatments, even though they have already been proven, several times, to be ineffective against Sars-Cov-2. Without a national direction, the states had to make different decisions from one another, not aligned with science but with political ideologies. This fact has been harming the population, as well as increasing the total number of cases and deaths (PETHERICK et al, 2020).

According to Buss et al (2021), the transmission rate is constantly high and the most vulnerable are among the most affected, especially, as Ahmed et al (2020) points out, those with less financial conditions to isolate themselves or even to pay for private hospitals, further burdening the SUS. In this sense, once the clinical disorder is detected, it is necessary to deal with it in a pragmatic and scientific way, adopting all the procedures that are studied and analyzed by researchers, making it a central role of the rulers to indicate the proven and most correct way to act in each situation.

This paper aimed to study, analyze the phenomenon of pandemics and how they are linked to human beings. During this study, definitions of what nature would be where humans, as well as animals, are, were extracted from the literature. Articles dealing with other pandemics were analyzed, and links were found between the devastation of the natural environment of some animals that forced them to live with humans. From this contact, the transmission of zoonoses, either through feeding based on these animals, kept inappropriately, or by their creation very close and without special care.

However, what has been seen leads us to understand that the more humans perfected their machines, the more severe the changes in natural environments and the larger the cities with nonexistent quality of life and sanitation. Soon plagues appeared that, almost always, derived from a zoonosis.

It was seen that, even with the years passed and basic sanitation/health techniques in big cities, the human being seeks more and more to extract resources from nature, with advances without analysis of the resulting impacts and preservation, the sights of profit, among other quick benefits, without thinking about the future generations of living beings that make up the complexity of life on the planet.

Another important factor to consider is the belief in man as being superior to all the other animals and resources that the planet possesses, without thinking about biodiversity and what can be generated from so much destruction of the natural environment. Aligning all this to a thought of denial of science in all areas, whether when talking about risks of pandemics, even global climate risks. With fauna and flora being lost and water contaminated with the manufacture of technological products, humanity becomes increasingly sensitive to pandemics.

It is known that the announcement of a pandemic caused by some coronavirus was already old, as there are several other diseases with a chance of becoming a new pandemic. In view of this, anti-scientific thinking, which is verified in various parts of the globe, needs to be fought in an educational way.

The advent of communication technologies has facilitated access to unparalleled knowledge, but, on the other hand, it has also given rise to false news and information that are difficult to combat in time, as the speed of propagation of false information needs to be clarified and, clarification is often complex and difficult for ordinary citizens to understand.

V. CONCLUSION

The conclusion of the present paper is given in the assessment that there is a need to find ways to sensitize and educate the population as a whole. This needs to be done in a scientific way and that this same knowledge is easy to understand or in conjunction with the improvement in educational and public health systems worldwide.

Rulers need to take into account the impacts of their speeches and fairly propagate scientific and proven information on all topics brought to public attention. All this together with the protection of the environment, in order to convey the notion that we are also part of the environment and not an isolated fragment or masters of everything that

surrounds us. In addition, environmental awareness and communion with the environment in which we live are necessary.

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REFERENCES

- [1] ABRAM, N., McGregor, H., Tierney, J. et al. 2016. Early onset of industrial-era warming across the oceans and continents. *Nature*. Disponível em: <https://doi.org/10.1038/nature19082>. Consultado em 20 de março de 2021.
- [2] AHMED, Faheem. Ahmed. Na'eem. Pissarides, Christopher. Stiglitz, Joseph. 2020. Why inequality could spread COVID-19. *The Lancet Public Health*. Acesso em: [https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667\(20\)30085-2/fulltext](https://www.thelancet.com/journals/lanpub/article/PIIS2468-2667(20)30085-2/fulltext). Acesso em: 10 de junho de 2021
- [3] ANDERSEN, K.G., Rambaut, A., Lipkin, W.I. et al. 2020 The proximal origin of SARS-CoV-2. *Nat Med*. Disponível em: <https://doi.org/10.1038/s41591-020-0820-9>. Acesso em: 25 de março de 2021
- [4] AUFDERHEIDE ZHU, T., Korber, B. T., Nahmias, A. J., Hooper, E., Sharp, P. M. and Ho, D. D. 1998. An African HIV-1 Sequence from 1959 and Implications for the Origin of the epidemic». *Nature*. Disponível em: <https://www.nature.com/articles/35400>. Consultado em 21 de março de 2021.
- [5] BARBERIA, Lorena G. GÓMEZ, Eduardo J. 2020. Political and institutional perils of Brazil's COVID-19 crisis. *National Library of Medicine*. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/32738938/>. Acesso em: 09 de junho de 2021
- [6] BARRÉ-SINOSSI F; Chermann JC; Rey F; et al. 1983. Isolation of a T-lymphotropic retrovirus from a patient at risk for acquired immune deficiency syndrome (AIDS). *Science*. Disponível em: <https://science.sciencemag.org/content/220/4599/868>. Acesso em 21 de março de 2021
- [7] BARRETO ML. 1998. Ambiente e saúde. *Rev C S Col*
- [8] BASSI, Bruno. 2019. A nova cara da bancadarruralista. *Heinrich Böll Stiftung*. Disponível em: encurtador.com.br/efwzR. Acesso em: 25 de março de 2021
- [9] BERKMAN, A. Garcia, J. Munoz-Laboy, M. Paiva, V. Parker, R. 2005. A critical analysis of the Brazilian response to HIV/AIDS: Lessons learned for controlling and mitigating the epidemic in developing countries. *Web of Science*. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1449335/>. Acesso em: 09 de junho de 2021

- [10] BRIGGS, Stephen; KENNEL, Charles F; DAVID G, Victor. 2015. Planetary vital signs. *Nature*. Disponível em: encurtador.com.br/bitTW. Acesso em: 25 de março de 2021
- [11] BUSS, Lewis F. PRETE JR, Carlos A. ABRAHIM, Claudia M. M. MENDRONE JR, Alfredo. SALOMON, Tassila. 2021. Three-quarters attack rate of SARS-CoV-2 in the Brazilian Amazon during a largely unmitigated epidemic. *Science*. Disponível em: https://science.sciencemag.org/content/371/6526/288?ijkey=4963f795096a5d62a009ba3b573ebbc453f0acc3&keytype=tf_ipsecsha. Acesso em: 10 de junho de 2021
- [12] CAPRA, F. 1996. A teia da vida: uma nova compreensão científica dos sistemas vivos. São Paulo: Cultrix,
- [13] CHENG, Vincent C. C; Lau, Susanna K. P; Woo, Patrick C. Y; Yuen, Kwok Yung. 2007. Protein Structure and Sequence Reanalysis of 2019-nCoV Genome Refutes Snakes as Its Intermediate Host and the Unique Similarity between Its Spike Protein Insertions and HIV-1 PMC. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2176051/>. Acesso em: 25 de março de 2021
- [14] FIOCRUZ, 2021. boletim covid 2021_ extraordinário junho parte 1. Disponível em: https://portal.fiocruz.br/sites/portal.fiocruz.br/files/documentos/boletim_covid_2021_extraordinario_junho_parte1.pdf. Acesso em: 8 de julho de 2021.
- [15] FORNI, D., Cagliani, R., Clerici, M. & Sironi, M. 2017. Molecular evolution of human coronavirus genomes. *Trends Microbiol.* 25, 35–48.
- [16] FREITAS CM. 2003. Problemas ambientais, saúde coletiva e ciências sociais. *Rev C S Col*
- [17] GAO, F; Bailes E; Robertson DL; et al. 1999. Origin of HIV-1 in the chimpanzee *Pan troglodytes* troglodytes. *Nature*. Disponível em: <https://www.nature.com/articles/17130>. Acesso em: 21 de março de 2021
- [18] GIL, Antônio Carlos. 2010. Como elaborar projetos de pesquisa. 5. Ed. São Paulo: Atlas.
- [19] GORBALENYA, A.E., Baker, S.C. et al. Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. 2020. The species Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol* 5, 536–544. Disponível em: <https://doi.org/10.1038/s41564-020-0695-z>. Acesso em: 23 de março de 2021.
- [20] GOTTLIEB, MS. 2006. *Pneumocystis pneumonia*—Los Angeles. 1981. *Am J Public Health*. Disponível em: <https://ajph.aphapublications.org/doi/10.2105/AJPH.96.6.980>. Acesso em: 20 de março de 2021
- [21] HONIGSBAUM, Mark. 2018. Spanish flu: the killer that still stalks us, 100 years on. *The Guardian*. Disponível em: <https://www.theguardian.com/world/2018/sep/09/spanish-flu-pandemic-centenary-first-world-war>. Consultado em 19 de março de 2021
- [22] HYMES KB; Cheung T; Greene JB; et al. 1981. Kaposi's sarcoma in homosexual men—a report of eight cases. *Lancet*. Disponível em: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(81\)92740-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(81)92740-9/fulltext). Acesso em: 20 de março de 2021
- [23] JACOBI P. 2003. Educação ambiental, cidadania e sustentabilidade. *Cad Pesqui*; 118: 189-205.
- [24] JONES, K., Patel, N., Levy, M. et al. 2008. Tendências globais em doenças infecciosas emergentes. *Nature* 451, 990–993. <https://doi.org/10.1038/nature06536>.
- [25] KEYES, AA, McLaughlin, JP, Barner, AK et al. 2021. Uma abordagem de rede ecológica para prever a vulnerabilidade dos serviços ecossistêmicos às perdas de espécies. *Nat Commun* 12, 1586. Disponível em: <https://www.nature.com/articles/s41467-021-21824-x>. Consultado em 15 de abril de 2021.
- [26] KHALIL OAK, Khalil SS. 2020. SARS-CoV-2: Taxonomia, Origem e Constituição / SARS-CoV-2: taxonomy, origin and constitution. *Rev Med (São Paulo)*. set.-out.;99(5):473-9.
- [27] KHALIL, H., Ecker, F., Evander, M. et al. 2016. Declining ecosystem health and the dilution effect. *Sci*. Disponível em: <https://doi.org/10.1038/srep31314>. Acesso em: 25 de março de 2021;
- [28] KOLATA, Gina. 1999 Scientists uncover clues to flu epidemic of 1918. Disponível em: <https://www.nytimes.com/1999/02/16/us/scientists-uncover-clues-to-flu-epidemic-of-1918.html> ». *The New York Times*. Consultado em 19 de março de 2021
- [29] LAM, TT et al. 2020. Identifying SARS-CoV-2-related coronavirus in Malayan pangolins. *Nature* 583, 282–285.
- [30] LI, Q. et al. 2020. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *N. Engl. J. Med*. Disponível em: <https://www.nejm.org/doi/full/10.1056/nejmoa2001316>. Acesso em: 23 de março de 2021
- [31] LITTLE, L. K. 2007. *Plague and the end of antiquity: The pandemic of*. Cambridge University Press.
- [32] LIU, P. et al. 2020. Os pangolins são o hospedeiro intermediário do novo coronavírus de 2019 (SARS-CoV-2)? *PLoS Pathog.* 16, e1008421.
- [33] MA, JOSEPHINE. 2020 Coronavirus: China's first confirmed Covid-19 case traced back to November 17. *South China Morning Post*. Disponível em: <https://www.scmp.com/news/china/society/article/3074991/coronavirus-chinas-first-confirmed-covid-19-case-traced-back>. Acesso em 24 jan. 2021
- [34] MANDELL, Gerald L.; Bennett, John E.; Dolin, Raphael, eds. Mandell, Douglas, and Bennett's 2010. *Principles and Practice of Infectious Diseases* 7th ed. Philadelphia, PA: Churchill Livingstone/Elsevier.
- [35] MARQUES, Pedro Vilela. 2018. Aquecimento global: temos 12 anos para salvar o planeta. *Diário de Notícias*. Disponível em: <https://www.dn.pt/vida-e-futuro/aquecimento-global-temos-12-anos-para-salvar-o-planeta-9966851.html>. Acesso em: 25 de março de 2021
- [36] MASSUDA, Adriano. Hone, Thomas. Leles, Fernando Antonio Gomes. Castro, Marcia C de. Atun, Rifat. 2018. The Brazilian health system at crossroads: progress, crisis and resilience. *BMJ Global Health*. Disponível em: https://gh.bmj.com/content/3/4/e000829?ijkey=01dc5050bbfd380c766432b3b879309572f1b400&keytype=tf_ipsecsha. Acesso em: 09 de junho de 2021

- [37] MEYER-ABICH, K. M. 2018. Revolution for nature: from the environment to the coonatural world. Cambridge: The White Horse Press.
- [38] MOREL, Ana Paula Massadar. 2021. Negacionismo da Covid-19 e educação popular em saúde: para além da necropolítica. Universidade Federal Fluminense, Rio de Janeiro, Brasil. Disponível em: https://www.scielo.br/scielo.php?pid=S1981-77462021000100404&script=sci_arttext. Consultado em 10 abril de 2021.
- [39] MORIN, E. 1988 O paradigmaperdido: a naturezahumana. 4. ed. Portugal: Publicações Europa-América. 222 p
- [40] O'NEILL, Y.V. 1993. Diseases of the Middle Ages. In: K F. Kipple. The Cambridge world history of human disease. New York, US: Cambridge University Press. pp. 270–279. 1993
- [41] ORGANIZAÇÃO MUNDIAL DA SAÚDE. 2020. Novel Coronavirus (2019-nCoV) SITUATION REPORT - 1Novel. Disponível em: <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200121-sitrep-1-2019-ncov.pdf>. Acesso em: 23 de março de 2021.
- [42] OUR WORLD IN DATA, 2022 Coronavirus (COVID-19) Vaccinations. Disponível em: <https://ourworldindata.org/covid-vaccinations?country=BRA>.
- [43] PETHERICK, Anna. Kira, Beatriz. Goldszmidt, Rafael. Barberia, Lorena. 2020. DO BRAZIL'S COVID-19 GOVERNMENT RESPONSE MEASURES MEET THE WHO'S CRITERIA FOR POLICY EASING?. University Of Oxford. Disponível em: <https://www.bsg.ox.ac.uk/research/publications/do-brazils-covid-19-government-response-measures-meet-whos-criteria-policy>. Acesso em: 09 de junho de 2021
- [44] PORTO MFS. 1998 Saúde, ambiente e desenvolvimento: reflexões sobre a experiência da COPASAD- Conferencia Pan-Americana de Saúde e Ambiente no Contexto do Desenvolvimento Sustentável. Rev C S Col 1998; 3(2):33-46.
- [45] PRIMAVESI, A. M. 1997. Agroecologia: ecosfera, tecnosfera e agricultura. São Paulo: Nobel.
- [46] REEVES, J. D. and Doms, R. W. 2002. Human Immunodeficiency Virus Type 2. J. Gen. Virol. Disponível em: <https://pubmed.ncbi.nlm.nih.gov/12029140/>. Consultado em 20 de março de 2021.
- [47] RIOU J, Althaus CL (janeiro de 2020). Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. Euro Surveillance. Disponível em: <https://www.eurosurveillance.org/content/10.2807/1560-7917.ES.2020.25.4.2000058>. consultado em 25 de março de 2021
- [48] RIPPLE, William j; Wolf, Christopher Newsome , Thomas M; Barnard, Phoebe; Moomaw, William R. 2019. BioScience. Disponível em: <https://academic.oup.com/bioscience/article/70/1/8/5610806> . Acesso em: 25 de março de 2021
- [49] SHANKS, GD. 2016. No evidence of 1918 influenza pandemic origin in Chinese laborers/soldiers in France. Journal of the Chinese Medical Association. Consultado em 18 de março de 2021.
- [50] SHARP, P. M.; Bailes, E.; Chaudhuri, R. R.; Rodenburg, C. M.; Santiago, M. O.; Hahn, B. H. 2001. The origins of acquired immune deficiency syndrome viruses: where and when?. Philosophical Transactions of the Royal Society B: Biological Sciences. Disponível em: <http://web.archive.org/web/20120916131230/http://www.aidsorigins.com/pdfs/rs/sharp.pdf>. Consultado em 19 de março de 2021.
- [51] SHARP, PM; Hahn, BH. 2011. Origins of HIV and the AIDS Pandemic. Cold Spring Harbor perspectives in medicine. Disponível em: <https://science.sciencemag.org/content/313/5786/523>. Acesso em: 21 de março de 2021
- [52] SOUSA, João Dinis de; Müller, Viktor; Lemey, Philippe; Vandamme, Anne-Mieke; Vandamme, Anne-Mieke . Martin, Darren P. 2010. High GUD Incidence in the Early 20th Century Created a Particularly Permissive Time Window for the Origin and Initial Spread of Epidemic HIV Strains. PLoS ONE. Disponível em: encurtador.com.br/jMRTZ. Consultado em 21 de março de 2021.
- [53] STEFFEN, Will. Grinevald, Jacques. Crutzen, Paul. McNeill, John. 2010 The Anthropocene: conceptual and historical perspectives. THE ROYAL SOCIETY PUBLISHING. Disponível em: <https://royalsocietypublishing.org/doi/abs/10.1098/rsta.2010.0327> .Consultado em 26 de maio de 2021.
- [54] TREINTA, Fernanda Tavares; FILHO, José Rodrigues Farias; SANT'ANNA, Annibal Parracho; RABELO, Lúcia Mathias. 2014. Metodologia de pesquisa bibliográfica com a utilização de método multicritério de apoio à decisão. Disponível em: [https://www.prod.org.br/doi/10.1590/S0103-65132013005000078#:~:text=O%20processo%20envolve%20a%20formação,apoio%20à%20decisão%20\(MAD\)](https://www.prod.org.br/doi/10.1590/S0103-65132013005000078#:~:text=O%20processo%20envolve%20a%20formação,apoio%20à%20decisão%20(MAD)). Consultado em: 15 de janeiro de 2021.
- [55] WADE, Nicholas. 2010. Europe's Plagues Came From China, Study Finds. The New York Times. 2010. Disponível em: <https://www.nytimes.com/2010/11/01/health/01plague.html>. Acesso em 10 abril de 2021
- [56] WEISS, RA. 2002. How does HIV cause AIDS?. Science. Disponível em: <https://www.nature.com/articles/nrc797>. Acesso em 22 de março de 2021
- [57] WILLEIT, M., Ganopolski, A., Calov, R. and Brovkin, V. 2019. Mid-Pleistocene transition in glacial cycles explained by declining CO2 and regolith removal, Science Advances. Disponível em: <https://advances.sciencemag.org/content/5/4/eaav7337?rel=outbound>. Acesso em 2 de abril de 2021
- [58] WU, Yuntao; Ho, Wenzhe; Huang, Yaowei; Jin, Doing-Yan; Li, Shiyue; Liu, Shan-Lu et al. 2020. SARS-CoV-2 is an appropriate name for the new coronavirus. The Lancet. Disponível em: [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30557-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30557-2/fulltext). Acesso em: 23 de março de 2021.
- [59] XIAO, K. et al. 2020. Isolamento de coronavírus relacionado com SARS-CoV-2 de pangolins malaios. Nature 583, 286-289

- [60] YAMAMOTO, Vicky. Bolanos, Joe F. Fiallos, John. Strand, Susanne E Morris, Kevin. Shahrokhinia, Sanam. Cushing, Tim. Hopp, Lawrence. Tiwari, Ambooj. Hariri, Robert. Sokolov, Rick. Wheeler, Christopher. Kaushik, Ajeet. Elsayegh, Ashraf. Eliashiv, Dawn. Hedrick, Rebecca. Jafari, Behrouz. Johnson, J. Patrick. Khorsandi, Mehran. Gonzalez, Nestor. Balakhani, Guitau. Lahiri, Shouri. Ghavidel, Kazem. Amaya, Marco. Kloor, Harry. Hussain, Namath a. Huang, Edmund. Cormier, Jason.
<https://content.iospress.com/articles/journal-of-alzheimers-disease/jad200831>. Consultado em 10 de julho de 2021.